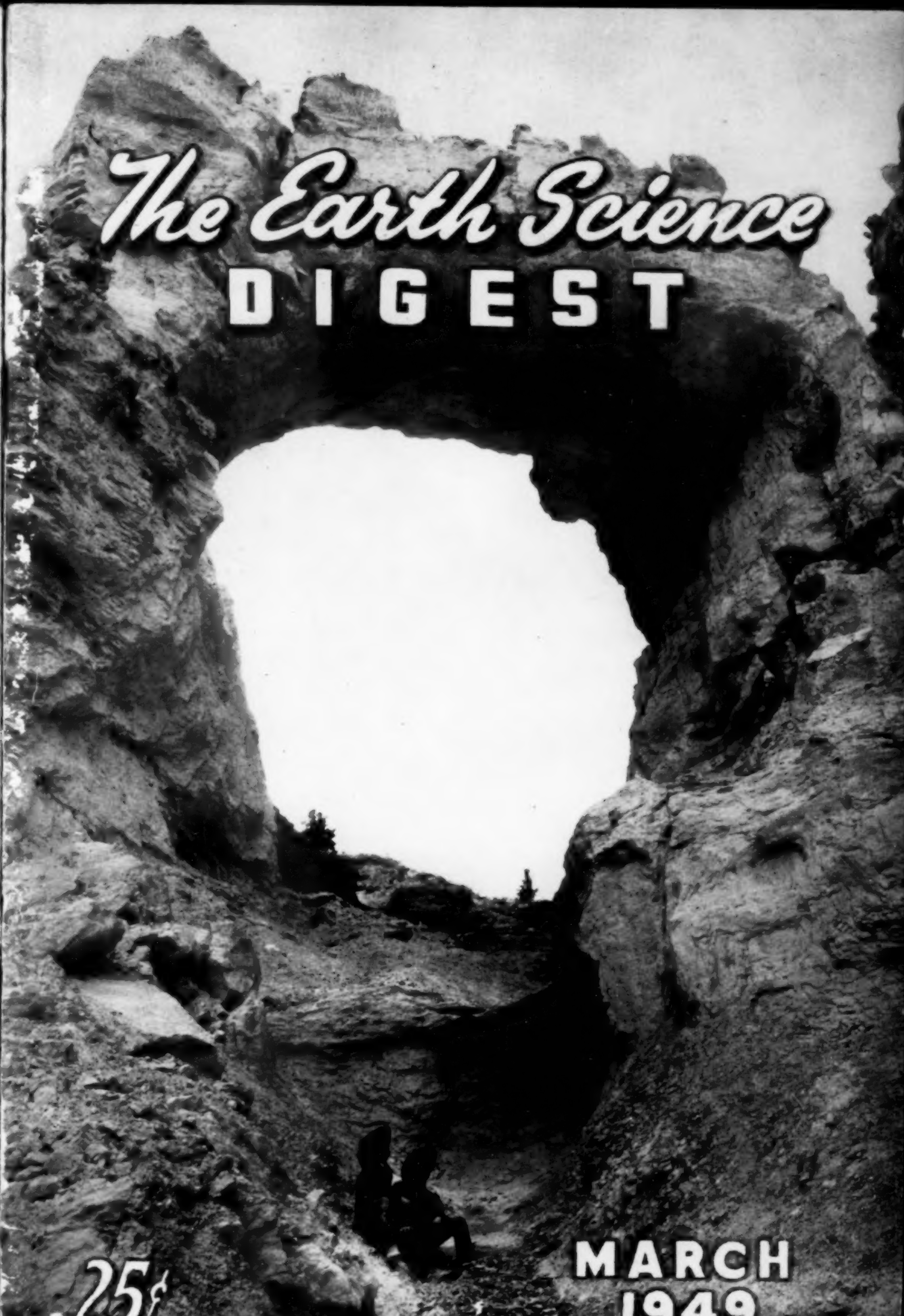
The Earth Science
DIGEST
25¢
MARCH
1949

The Earth Science Digest

Revere, Massachusetts

A magazine devoted to the geological sciences.

Jerome M. Eisenberg, Editor

THE EARTH SCIENCE DIGEST is open to articles of geologic interest. Manuscripts, photographs and sketches will be returned if accompanied by ample first-class postage.

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COVER PHOTO

This month's cover photo is of the Natural Bridge at Bryce Canyon National Park. See "The Bryce Canyon National Park" by Roger L. Spitznas in the February, 1949, *Earth Science Digest.* Photo courtesy of the Union Pacific Railroad.

THE EARTH SCIENCE INSTITUTE

The organizing meeting of The Earth Science Institute was held at Boston University on February 25, 1949. The following officers were elected:

C. W. Wolfe, President

Gilbert O. Raasch, 1st Vice-President

H. P. Zuidema, 2nd Vice-President

Jerome M. Eisenberg, Executive Secretary

H. R. Aldrich, Councilor

C. S. Hurlbut, Jr., Councilor

The time and place of the first annual meeting will be announced in the near future.

The Earth Science Institute is a non-profit organization, created exclusively for education in and promotion of the earth sciences. Membership is open to all persons and organizations interested in the fields of geology, mineralogy, paleontology, and allied earth sciences. Members of the Institute receive The Earth Science Digest, an exchange bulletin, library privileges, and many other services. Subscribers to *The Earth Science Digest* desiring to join may credit their annual dues with the amount of their unexpired subscription. Application blanks may be obtained from the executive secretary.

The plans of the Earth Science Institute include among other things: publications on the earth sciences; sponsorship of organizations, field work, meetings; a library; acquainting the public with the earth sciences through exhibitions, lectures, publicity; and the exchange of specimens.

For further information, please write to the executive secretary, Jerome M. Eisenberg, The Earth Science Institute, Revere, Mass.

1949 MEETINGS AND CONVENTIONS

American Association of Petroleum Geologists, 34th Annual Meeting; Society of Economic Paleontologists and Mineralogists, 23rd Annual Meeting; Society of Exploration Geophysicists, 19th Annual Meeting. March 14–17, 1949. St. Louis, Missouri.

State Mineral Society of Texas, Annual Mineralogical Show. April 23–24, 1949. San Antonio, Texas.

Oneonta Science Congress, 8th Annual Meeting. May 7, 1949. Oneonta, New York.

American Federation of Mineralogical Societies, 2nd National Convention; California Federation of Mineralogical Societies, 10th Annual Convention. June 24–26, 1949. Sacramento, California.

Rocky Mountain Federation of Mineral Societies, Annual Convention. August 25–27. Albuquerque, New Mexico.

Geological Society of America, 62nd Annual Meeting; Paleontological Society, 41st Annual Meeting; Mineralogical Society of America, 30th Annual Meeting; Society of Vertebrate Paleontology, 9th Annual Meeting. November 10–12, 1949. El Paso, Texas. (See page 6.)

SCHORTMANN'S EXHIBITION AND SALE POSTPONED

Our readers will please note that the annual exhibition and sale of mineral specimens conducted by Schortmann's Minerals, scheduled for April 15–16, 1949, in New York City, has been postponed.

The Moonscar Upon The Earth

HARALD KUEHN
Iserlohn, Westphalia, Germany
Translation by Wolfgang V. Swarzenski, Boston University

Part Two of a Two-Part Article

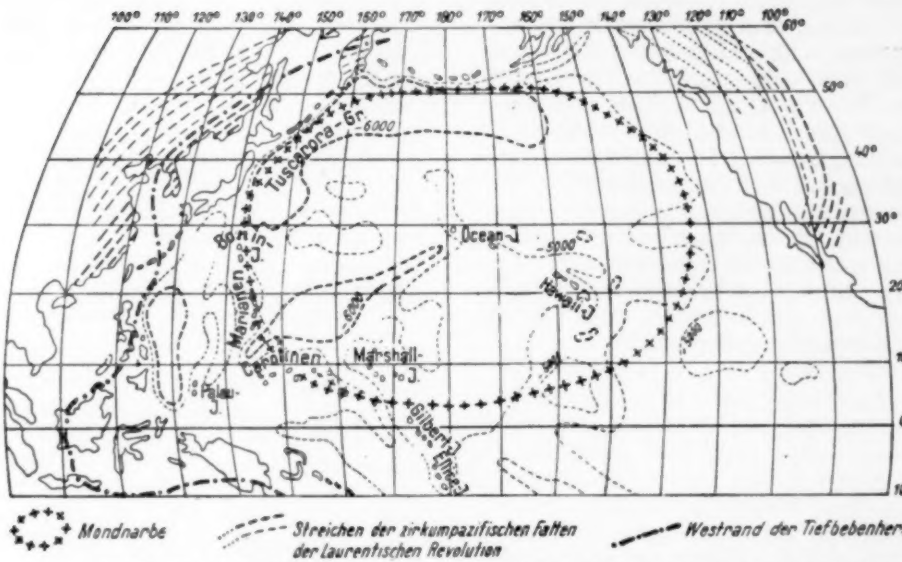


Figure 1. The North Pacific Depression, the deepest indentation of the earth's crust, showing the "moonscar" (mondnarbe), the strikes of the circum-Pacific faults of the Laurentian Revolution (streichen, etc.), and the world's deepest foci for earthquakes (westrand, etc.).

The moon's original location is not to be sought for in the entire Pacific area, but rather in a locality bordered by the equator and 50° N. Latitude, extending from 130° E. Longitude to 130° W. Longitude. The North Pacific Depression, thus circumscribed, represents the most extensive and, with its marginal fault zones, the deepest indentation of the earth's crust. Over an area of 13.5 million sq. mi., the sea bottom occurs at a depth of 2.5 - 3.7 miles, the average being 3.2 miles. If the northern Pacific, which represents less than 1/20 of all the water present on earth, is not included in the calculation, we arrive at an average depth of 2.3 miles below mean sea level for all other oceans, as compared to 3.2 miles for the North Pacific deep. If we calculate the depth of the Pacific Ocean alone, we find the northern part of it to be still 0.9 miles below its average depth.

The North Pacific indentation is further characterized by tectonic fault zones of great depth, occurring at its margins. Deep sea channels, bordering the area, bear witness to the violent shattering of the earth's crust, as in the Marianas, Philippine Islands, Kamchatka, Aleutians, Alaska, and New Pomerania. These fault zones are manifest, even to-day, by earth quakes and volcanism. The world's deepest foci for earthquakes are located in this zone, which is nearly parallel to the "moonscar". Among 475 presently active volcanoes, 299 are located at the margin or within the area of the indentation.

The peculiar position of the northern Pacific became probably most apparent through the results of seismic and gravimetric investigation. Whereas the entire remaining crust contains a thick cover, up to 35 miles, of lighter silicates, Sial* material is almost completely lacking in the Pacific depression. Seismographic measurements revealed a velocity of 4–4.3 miles per second for longitudinal waves at the sea bottom, indicative of gabbro and plateau basalt, which occur at much greater depth in all other parts of the world.

As a result of his studies of the Pacific, Daly assumes that a solid crust exists from the sea floor, at a depth of 3.2 miles, down to a depth of 50 miles below mean sea level; 25 miles of basalt (density 3) would lie over 21 miles of piezo-gabbro (density 3.05). Amorpho-plastic, glassy basalt would follow in depth. It is significant that the cover of lighter silicates seems to be lacking only in the North Pacific. According to Gutenberg and Richter, Sial rocks are present in the Central and South Pacific as well as in the Atlantic and Indian Ocean. The North Pacific would seem to be a unique area, differing from the entire remaining crust of the earth. It is not surprising that some rocks of that area are so specific as to make identification with rocks of any other locality impossible. They were grouped separately, as oceanites. They are characterized by their abnormally

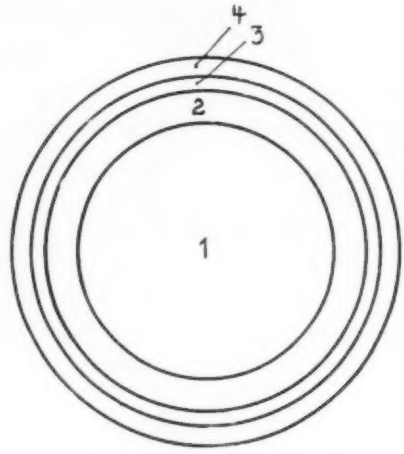


Figure 2. A section through the moon, showing the inferred principal zones and their composition. 1. Hortonolith (olivine) core. 2. Dunite shell. 3. Pyroxenite shell. 4. Sial-Sima crust.

high content of olivine and monoclinic pyroxene. Monoclinic pyroxene is indicative of high temperature conditions at the time of formation. It may be concluded, with great probability, that these rocks had their origin in great depth. Very likely, the magma rose from the earth's dunite shell. Oceanites or pacifites, as they are called by Barth, have a composition which lies between that of basalts and dunites.

By their nature, the effects of the moon's splitting-off could not be localized in the scarred area, as it is outlined in the diagram above (Fig. 1). In the mountain systems of adjoining continents we might be able to recognize structures which had their origin in the moon's splitting-off. The Laurentian Revolution, between the Archeozoic and Algonkian eras, was probably the most powerful to which the earth's crust was subjected. The profound changes produced on the surface of the earth during that time are sometimes interpreted as consequences of the

*SIAL is a combination of the chemical symbols for silicon (Si) and aluminum (Al), which, combined with oxygen, are the principal elements in these rocks.

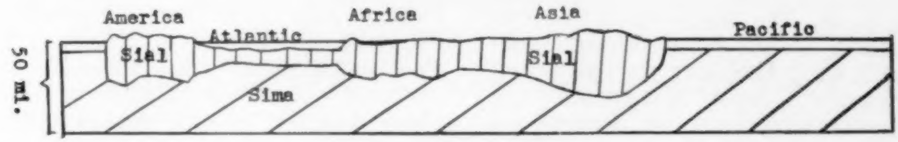


Figure 3. The layered structure of the earth (schematic and greatly simplified).

moon's splitting-off. Although the whole earth was involved, the margins of the probable "moonscar" have remained outstanding. Laurentian folds border the Pacific. The strike direction of the surrounding mountains is "circum-pacific." The unique position of the area is further expressed in the fact that it does not fit into the general system of distribution of rigid continents and orogenic zones, as it applies to the remainder of the earth's crust.

The Sial cover of the Pacific area must have been blasted off at the time of the moon's formation. Basic and ultra-basic magma closed the gap, perhaps by lateral flow. Because of its density being greater than that of the Sial crust, the magma, in accordance with the mass-action law, did not rise to the ellipsoidal plane which would, theoretically, constitute the earth's limit. Basic magma, because of its higher specific gravity, needed a lesser momentum to replace the split-off mass of Sial crust and to re-establish equilibruim. Sial magma, on the other hand, would have had to rise to a level 1.9 miles higher, to furnish equilibrium. Thus we can explain the conspicuous depth of the North Pacific Ocean. Although the huge crater does not exist in its original depth, we can readily imagine that the moon mass was split off from that particular area of the earth. The center of the depression lies just south of Ocean Island which belongs to the Hawaiian group. The meteorite which caused the splitting-off is thought to have hit the earth's crust at a low angle; it was less than the angle of the Arizona meteorite, which was 30°. The direction of the impact would have been from east to west, contrary to the direction of the earth's rotation. This assumption is supported by the presence of many deep fault zones at the western margin of the crater which was shattered more than the eastern margin.

Haarmann's conception concerning the origin of the moon is quite different from the theory just stated. Haarmann is strongly of the opinion that light Sial magma played a major part in the closing of the crater, a fact which Quiring disclaims. Much larger quantities of the lighter magma would have been necessary to compensate for the loss of mass. Haarmann concludes, therefore, that the moon did not originate in that part of the earth's crust which shows to-day the deepest depression, but rather in the area of the highest mountains where huge Sial masses were instrumental in sealing the scar in the earth's crust. He refers to the mountains and plateaus of Asia. Probably, the Sial crust is floating in heavier underlying strata, as ice floats in the ocean. Consequently, the maximum superficial elevation would correspond to the maximum extension of the Sial mass in depth, toward the Sima* (Fig. 3).

At the time of the moon's splitting-off, in the Archeozoic era, the continents would have been laid out already as units in the hardening crust. The continental mass of Eurasia would have moved eastward, over the scar on the crust; underneath, liquid Sial entered the gap, creating there the largest accumulation of Sial material on the earth. In greater depth, of course, the scar was filled largely by material from the inner shells. At the time of the moon's separation the earth lost 1/50 of her volume, and 1/82 of her mass. The continental mass of Eurasia, in its eastward movement, did not cover the whole scar; the movement was considerably slowed down by the thickening which occurred with the continued Sial flow. Thus the western part of the Pacific would have to be included in the area of the moon's origin. It is possible that the Atlantic Ocean was already formed at that time as a result of a rift occurring at the far end of the eastward drifting continents. The eastward movement of the East Asiatic island groups and the northward movement of New Guinea and Samoa, if really existent, might be interpreted as still active forces seeking to restore equilibrium in an area which became disturbed by the separation of the moon mass.

GEOLOGICAL SOCIETY OF AMERICA PLANS EL PASO, TEXAS, MEETING

The general subject of marine geology will be featured at the sixty-second annual meeting of the Geological Society of America, to be held at El Paso, Texas, November 10-12, 1949. Also featured on the program will be a number of papers on "Arizona structures with emphasis on overthrusting", prepared by members of the Arizona Geological Society. A half day will be devoted to each of these subjects.

Five *concurrent* field trips will be offered, each starting Sunday morning, November 6 and ending Wednesday evening, November 9.

Excursion I. *Petrology and Igneous Geology of the Big Bend Area:* Big Bend National Park, Chisos Mountains, Santa Elena Canyon, Study Butte and Terlingua (old quicksilver mines), Green Valley, Quitman Mountains.

Excursion II. *The Cenezoic Geology of the Llano Estacado and Rio Grande Valley:* Lubbock (vertebrate site), Rich Lake, Yellow House Canyon, White River Canyon, Plainview (early man locality), Llano Estacado deposits, Santa Fe formation, Kilbourne hole.

Excursion III. *Central Mining District, New Mexico:* Numerous studies of the various types of mineralization; Santa Rita open pit of the Kennecott Copper Company, manganese mines at Silver City and Deming, etc.

Excursion IV. *The Permian Rocks of the Trans-Pecos Region:* Marathon Basin, Alpine, Glass Mountains, Carlsbad Caverns, Guadalupe Mountains, Diablo front, Diablo Mountains, Apache or Victorio Canyon, etc.

Excursion V. *Pre-Permian Rocks of Trans-Pecos Area and of Southern New Mexico:* Alpine, Marathon Basin, Beach Mountain, Allamoore (pre-Cambrian exposures), exposures of El Paso Ordivisian limestones; Hueco Mountains, Sacramento Mountains.

The Earth Sciences — 1949

by Science Service

NEW FOSSIL COYOTE SPECIES DESCRIBED IN CALIFORNIA

BERKELEY, Calif., Jan. 29 — A coyote-like animal with some of the features of a hyena is represented by a fossil skeleton found near Ricardo, Calif., and described in a new University of California scientific publication by Morton Green, graduate student in paleontology.

The animal, which Mr. Green has named Tomarctus robustus, was shorter-legged and bigger-pawed than the modern coyote. It had heavy crushing jaws, which further heighten its resemblance to the hyena.

In the place where the animal's stomach was when it lay down and died were found the remains of its last meal, the teeth and crushed bones of a rabbit.

UNDERGROUND COAL FIRES ARE TO BE EXTINGUISHED WITH GOVERNMENT AID

WASHINGTON, Feb. 3 — An important step in coal conservation, and in the protection of health and property, is now underway by the U. S. Bureau of Mines in extinguishing underground fires in coal seams. The new work is made possible by an appropriation of $250,000 by the last Congress.

There are some 50 such fires in coal beds in seven states that have been investigated by the Bureau in the past six months, James Boyd, director of the government agency, has revealed. Some of them have burned uncontrolled for years, he stated. An underground or outcrop coal-mine fire will be likely to burn as long as there is combustible material to consume and a supply of oxygen to keep the fire alive.

These fires, originating usually through carelessness, present a serious threat to buildings, surface property, and the life and health of persons near the affected area. Most of the outcrop fires are believed to have started from burning rubbish, forest fires, or workmen, hunters or others building fires near the outcrop off the coal bed. Fires in abandoned mines have often started in debris left in the mines. They travel from the abandoned mine to other locations.

Work in extinguishing underground fires has already been started in two locations, one in Pennsylvania anthracite area, the other in western Colorado, near the Bureau's plant at Rifle for recovering fuel oils from oil shale. If not checked, this burning will destroy over 1,500,000 tons of bituminous coal adjacent to a mine now abandoned because of this fire.

The job of extinguishing an underground coal fire is not easy, and it costs a lot of money. The process usually consists of stripping along the outcrop of the coal beds that have been partly mined and abandoned, back-filling with an incombustible material, excavations, drillings, flushing, flooding the region, and in many cases the relocation of buildings that interfere with fire-control operations.

Fire control in an active mine is the job of the operator. In unopened mines and abandoned mines, it is usually too big and expensive an undertaking for the owner. The Bureau's work will be confined largely to the abandoned mines, particularly where the fire is a hazard to the neighborhood, and from which additional coal may some day be wanted even if mining costs will be much higher than was required to remove the more desirable seams.

EARTH'S ATMOSPHERE NOT FORMED AT TIME PLANET WAS BORN

CHICAGO, Feb. 10 — The earth's atmosphere as we know it today did not exist at the time our planet was created.

The water, nitrogen, oxygen and carbon dioxide that largely make up our atmosphere were formed by chemical processes that took place after the birth of the planet on which we live.

This is the conclusion reached by Dr. Harrison Brown, associate professor of chemistry at the Institute for Nuclear

Studies at the University of Chicago. His study of the permaent gases, helium, neon, argon, krypton and xenon indicate that early in its history the earth lost all the gases it may originally have possessed.

The major constituents of the atmosphere during the process of earth formation were locked up chemically in the earth and subsequently released. Thus the earth's atmosphere is almost entirely of secondary origin, he reasons.

"It is perhaps too early to speculate as to the exact nature of the chemical processes involved," Dr. Brown reports, "but it seems reasonable to suppose that the marked differences in the composition of the atmospheres of these three neighboring planets (Venus, the earth and Mars) may in the future be explained upon the basis of their difference in size, internal composition and temperatures."

The possiblity that most terrestrial argon has been produced by the decay of radioactive potassium produces an interesting speculation concerning the atmospheres of both Mars and Venus, Dr. Brown states in "The Atmospheres of the Earth and Planets," University of Chicago Press book issued here today, and edited by Dr. Gerard P. Kuiper, director of Yerkes and McDonald Observatories.

If we assume the surface potassium content of both these planets to be similar to that of the earth and neglect escape processes Dr. Brown says, then both planets should have argon atmospheres similar to that of the earth. Thus argon might well be the chief constituent of Mars' atmosphere.

EARLY AMERICAN INDIANS DUG IN UNDERGROUND BUT SCIENTISTS CAN'T FIGURE OUT WHY

CHICAGO, Feb. 11 — If atomic or biological warfare ever drives modern Americans underground, they won't be the first Americans to dig themselves in.

How peaceful Stone Age Americans Indians went underground has been unearthed in the Southwest by scientists from the Chicago Natural History Museum.

These early underground Americans apparently holed up without any threat of war. The history which is being pieced together of the roving Stone Age Cochise Indians and the Monollones who built pit-houses in southwest New Mexico is strange compared with most history. These Indians, it appears, spent 6,000 years at peace.

Dr. Paul S. Martin, who led the expedition into the Southwest last summer, explains that Cochise Indians apparently roamed around southeastern Arizona and southwestern New Mexico about 4,000 B.C. searching for water. Only remaining evidence of these nomadic Americans yet found was 12 feet below the surface at a flowing spring called Wet Leggett in southwest New Mexico. Here the Chicago scientists discovered Stone Age tools of these ancient Indians.

What went on for the next 5,500 years is pretty much a blank. But about 500 A. D., the oldest known pit-houses of the Mogollones were built, or rather dug.

They were simpley a cellar with a roof. The "last word" in pit houses has been designated Pit-house K. It is approximately 28 by 28 feet and about four feet deep. The scientists speculate that "K" was probably at least a chief's home, and more likely a ceremonial chamber.

Five husky modern workmen needed two weeks to excavate the pit, and it must have taken the primitive Indians at least twice as long to build it, not counting the preparation of the logs which supported the roof.

For nearly 500 years, the Indians of the Southwest lived in pit-houses. Then, about 1,000 A. D., they began to emerge and live on the surface in pueblos.

Why these wanderers dug into the earth and for five centuries lived in cellars is one of the mysteries the scientists hope to unravel with more discoveries in the ancient home of the Cochise and Mogollones.

NEWLY DISCOVERED MANGANESE DEPOSITS IN BRAZIL

CINCINNATI, Feb. 21 — There is plenty of high-grade manganese for the American steel industry in newly discovered deposits near the mouth of the Amazon river in Brazil, it is reported here by Dr. Kenneth E. Caster of the University of Cincinnati.

They are much nearer to America than most other foreign manganese sources, and their development would free the United States of a need for the Soviet supply.

Dr. Caster is a geologist of the university's graduate school and has just returned from four years in South America where he was engaged in research under the auspices of the U. S. State Department and the Guggenheim Foundation.

Manganese is an essential metal in the manufacture of steel alloys and it plays an important part in other products. The United States has domestic deposits but the known reserves are far too small to meet the demands. Over 1,500,000 tons are imported normally each year. Russia is the principal source of supply, with India, the Gold Coast of Africa, the Union of South Africa, Cuba, Chile and Brazil important. In prewar days Russia produced approximately one-half the manganese ore used in the world.

Brazil has a great deal of manganese, Dr. Caster states. Present mining is in two well-known areas, one in western Brazil near the Paraguay border, and one north of Rio de Janiero. The deposits recently discovered are in the territory of Amapa between the Amazon and the Guianas, less than half as far from New York City as the other Brazilian deposits.

The Brazilian federal government a year ago authorized Brazilian companies to begin exploring these Amapa deposits. With its other deposits Brazil has much more manganese than needed to satisfy domestic needs. It is highly probable, Dr. Caster states, that these deposits may be of great and strategic importance to the United States.

Metallurgical manganese ore produced in the United States during 1946 amounted to less than 135,000 tons, coming from seven states but the great bulk mined in Montana. Production in war years was considerably greater, reaching some 241,000 tons in 1944. This is a small amount when compared with the 1,749,000 tons of foreign manganese ore imported in 1946, a year in which imports exceeded normal.

ADVICE ON URANIUM PROSPECTING COMES FROM BEHIND IRON CURTAIN

RON ROSS

WASHINGTON, Feb. 15 — American scientists and atomic prospectors hunting for the atom bomb element uranium have some tips from behind the Iron Curtain.

A relatively simple mathematical formula for telling how much uranium is concentrated in rock, using a Geiger-Mueller counter, was reported in the journal, Science, published here.

The authors are A. Szalay and Eve Csongor, Hungarian physicists at the University of Debrecen, Debrecen, Hungary. Their findings were made during a search for uranium in the Velence mountains in Hungary. They do not discusss whether or not they found important new deposits of the radioactive element in their survey.

But they do believe they have discovered an important aid to uranium hunters, which they are passing on to Americans.

Geiger-Mueller counters, usually known only by the first name, are essentially tubes with a delicate electrical balance and amplifiers for giving off a sharp click when radiation strikes the tube and changes its electrical charge. The Hungarian scientists point out that the counter is used in prospecting for uranium to reveal the presence of radioactive materials.

The problem they claim to have solved is determining from the number of clicks, with the aid of mathematical formulae, how much uranium is in the rock.

Here's the way the Hungarian physicists advise prospectors to find out in a hurry how much uranium is in rock:

Shield the Geiger counter tube — any commercial tube size — with a thickness of two millimeters (about eight-hundredths of an inch) of lead. Place the counter against the rock. Cosmic rays from outer space will make the counter click, even with no radioactive material in the neighborhood, so the clicks of the counter minus the cosmic ray count will give "x" times the cosmic ray count. That is, if the cosmic ray count is 10 per minute and you count 30 clicks each minute, "x" is two (10 cosmic clicks and 20 uranium clicks.)

The quantity of uranium in the rock is "x" times 25 grams of uranium per metric ton of rock ("x" times nearly nine-tenths of one ounce of uranium for about each 2,205 pounds of rock). If "x" is two, the rock would have only about one and eight-tenths ounces of uranium in each metric ton.

This fairly simple method is suggested by the Hungarian scientists for use by uranium explorers who want to cover lots of ground in a short time.

Neanderthal Man Had It Over Modern Muscle Men

If you think that Neanderthal man who lived around 50,000 years ago, had more powerful arms than modern man, you've been proved correct by some scientific experiments with strings.

Scientists have assumed that this was true because of the shape of the radius bones found from Neanderthal man. But, of course, no muscle survived from which to judge the strength of the arm.

Now, Drs. Leo Estel and C. Willet Asling of the University of California, Berkeley, have proved the theory by substituting strings for the muscle to measure the force needed to move varying loads at the end of the radius. Their conclusion was that the shape of the radius of Neanderthal man was such that he had a more powerful forearm than modern man.

In their report to the American Journal of Physical Anthropology, the California scientists point out that the radius of Neanderthal man resembles that of the powerful gorilla.

Scientists Are Racing Time in Nebraska

Scientists representing at least six fields are racing against time (and mad-made tide) in an effort to find out more about some people who lived in southern Nebraska thousands of years ago. How many thousands of years ago is one of the big questions which the scientists are seeking to answer.

Scene of this frenzied scientific activity is Ft-50, an excavation on the bank of Lime Creek, near Cambridge, Nebr. Lime Creek is a tributary of Medicine Creek, in turn a tributary of the Republican river. Although the discoveries which have excited scientists have been in the banks of Lime Creek for thousands of years, time is important now because of a dam which is being build on Medicine Creek.

Ahead of Schedule

Some time this summer Ft-50 will be inundated by water from the Medicine Creek dam, construction of which is unfortunately, from the standpoint of scientists in the region, nearly two years ahead of schedule.

Numerous artifacts, such as crude stone knives and scrapers and worked bone specimens, were found at the Lime Creek sites less than two years ago. It was the first time that evidence of such early man had been discovered on the Great Plains. Other discoveries included fossil remains of various animals, apparently related to modern forms of such animals as rabbits and bison but indicating distinct differences.

Whether the crude artifacts found at Lime Creek were made by people older than any known early man on the North American continent, where the Nebraska finds fit in with what is known of early man, his life and the geology of the Great Plains are all a part of the giant scientific puzzle which scientists are trying to piece together.

Cooperation

One of the most significant results of the discoveries, declares Dr. C. Bertrand Schultz, director of the Nebraska State Museum, is that for the first time extensive cooperative work at an excavation is being done by geologists, invertebrate and vertebrate paleontologists, archaeologists, geomorphologists and pedologists.

"We should get an answer sooner this way," declares Dr. Schultz. And with a man-made flood scheduled in the coming months, speed is important in unlocking the secrets at Ft-50.

THE GEOLOGICAL SURVEY

William E. Wrather, Director

The following article was condensed from a statement presented on February 4, 1949, before the Senate Committee on Interior and Insular Affairs:

INTRODUCTION

The Geological Survey, since its establishment 70 years ago, has been one of the major Federal research bureaus, engaged in developing and publishing facts about our mineral and water resources and our lands. Today we face so many critical problems related to those resources and lands, from the viewpoint of both military defense and peace-time economic development, that basic information about them is more urgently needed than ever before.

The Survey is charged with the responsibility for four major functions.

First, topographic mapping, which is basic to many phases of the other functions. Topographic surveys are directed toward the issue of standard three-dimensional maps of the United States that show with engineering accuracy the exact shape of the earth's surface as well as the location of all natural and man-made features.

Second, the geologic function, which embraces investigations of the geology of the Nation required to determine and appraise the distribution, uses, and reserves of mineral and mineral fuel deposits; and the conduct of research in related chemical and physical problems.

Third, the water-resources function, which includes investigations of the quantity, distribution, chemical quality, sediment content, availability, and utilization of the surface and underground water supplies of the United States, its territories and possessions.

Fourth, the Public-Lands and Conservation function, which includes the examination and determination of the mineral, water, and power values of the Public Lands; and, in the interest of conservation, supervision of the development by lessees of certain minerals on Public and other Federal and Indian lands.

The results of the Geological Survey's investigations and fact-finding activities are published and distributed as promptly as possible in the form of geologic, mineral, and water-resources reports and as topographic, geologic, and other types of maps.

This information is eagerly sought and used by the Military Establishment; by Federal and State governmental agencies responsible for the formulation of public policies and for planning and undertaking engineering and other public-welfare projects; and by the mineral industry, public utilities, transportation and communications agencies, and many others.

This brief summary of the four functions of the Survey, which I shall enlarge on presently, emphasizes, perhaps unduly, the practical applications of the results of its work. I believe that I should at this point restate that we are fundamentally a research agency, and make clear that the effectiveness of the applied phases of our work is dependent upon the degree to which we are successful in developing and maintaining an organization devoted to research of the broadest scope in all aspects of our four functional fields. I believe the Survey has an admirable record in regard to this in the past — as an example, the currently important applied sub-sciences of mining, petroleum, and ground-water geology almost wholly stem from and are based on the fundamental work by the Survey in past years — and I cannot emphasize too strongly that our usefulness to the Nation will to a large extent be dependent upon our ability to continue this record in the future.

We may now take a somewhat more detailed look at the nature, objectives, and accomplishments of each of the major functions of the Geological Survey.

TOPOGRAPHIC MAPPING

Topographic mapping of the United States and its possessions has been one of the important responsibilities of the Geological Survey since this bureau was formed. At first the mapping was mostly of a reconnaissance type — used in the preparation of general reports on the natural resources of the Nation. Gradually, however, topographic maps were put to a wider variety of uses, especially in connection with engineering planning and development activities. Thus the maps now are used not only as a base for reporting geological information, or for determining the drainage area of a river basin, but they are used also in the various engineering aspects of mining, forest utilization, irrigation and highway development, and many other activities involving use of the land.

The increasing utilization of topographic maps by the map-conscious public has been responsible for the definite trend away from the early reconnaissance type of maps which were made rapidly and cheaply and were published at small scales and with only generalized accuracy. Most of our maps are now published at the comparatively large scales of one or two inches to the mile, and they are compiled according to rigid specifications as to accuracy and content so that they can be readily used in a wide variety of engineering enterprises.

Obviously the cost of making topographic maps according to present-day requirements is high, and our progress toward the goal of completing the mapping of the entire United States is very slow. Fortunately, however, this trend toward higher costs and slower progress has been partly offset by the development of improved techniques and the invention and improvement of new mapping equipment — a field in which the Geological Survey has figured very prominently. Most of the new developments in mapping methods have centered around the aerial photograph. Many complicated and interesting instruments, developed for the making of maps from aerial photographs, are now in use in the Geological Survey. Contrary to popular belief, however, the aerial photograph does not offer a quick solution to the mapping problem. It is a very helpful aid which is being fully utilized, although a great amount of tedious and careful work must still be done by skilled personnel, both in the field and in the office, before a topographic map can be made that will be adequate for general use.

Topographic maps have been made and published for about half of the United States. Much of this mapping consists of reconnaissance surveys made prior to 1900 which are now completely obsolete. Only

about one quarter of the United States can be considered as adequately mapped according to present-day standards. An exhibit (see Figure 1) has been prepared showing the extent of adequate map coverage in the United States, and also showing the areas in which mapping is now in progress.

During the past three years we have made a rather careful inventory of all existing topographic maps, prepared either by the Geological Survey or by other agencies, and have published the results of that inventory in graphic form. That inventory is a part of a systematic effort that we are now making to assemble complete information on all useful maps, their quality, availability, etc. This will enable all map-users, especially the many Federal agencies that use map data, to obtain information in one central place on available maps without having to shop around among many sources for these data.

In addition to our cooperation with other Federal agencies, the Geological Survey has cooperated with the various States since 1885. The funds contributed by the States have been of very material assistance to the national mapping program. The best example of this joint effort is in Massachusetts where the mapping of the entire State was recently completed as the result of a project that extended over more than a decade.

For the past several years, and even at the present time, the topographic mapping required as a part of the Nation's military preparedness program has taken up a considerable part of the attention, capacity, and funds which the Geological Survey has available for topographic mapping. Each year we adjust our program to the Nation's most urgent needs for topographic mapping. It is hoped that in the not too distant future we can devote more attention to the mapping needed in the further development of our national resources and in the administration and utilization of the Nation's public lands.

GEOLOGY

One of the basic tasks of the Geological Survey since its founding has been to search for and appraise the mineral and mineral-fuel resources of the Nation. In order to perform that function, detailed geologic maps must be prepared showing the nature and distribution of the various rock formations. Every mineral deposit, whether it yields copper, petroleum, gravel, or any other mineral, is simply a special kind of rock formation. They are all the result of geologic processes, and can best be sought out and appraised by geologic techniques.

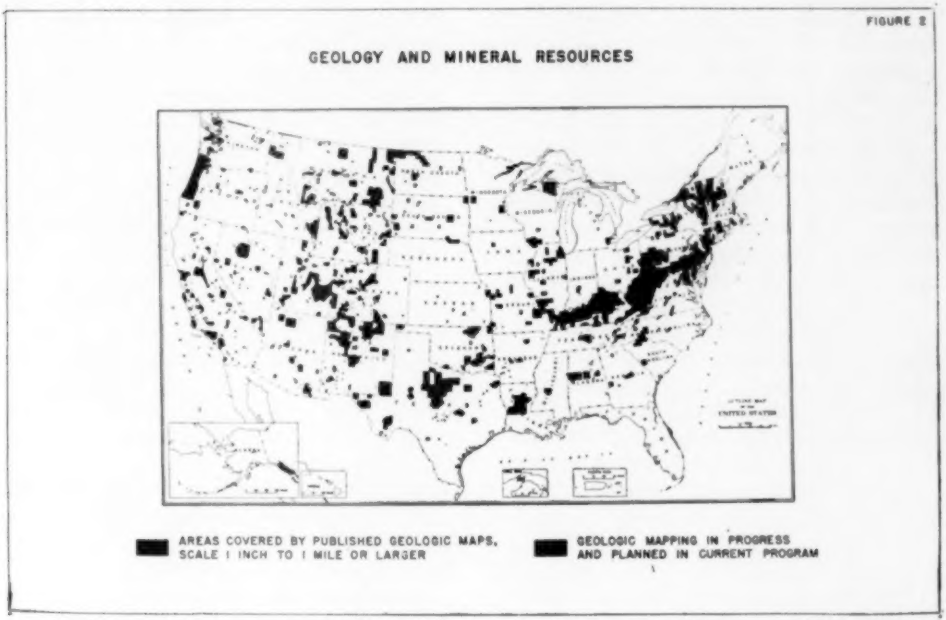
I think it is safe to say that virtually all our easily discoverable mineral deposits have already been found and are either being worked or have been worked out. But the science of geology indicates there are additional deposits of minerals and mineral fuels that do not crop out at the surface. These hidden deposits cannot be found by traditional prospecting, but exploration can be guided by geologic research and systematic geologic mapping. Both are being supplemented by research in geophysics and geochemistry and by field surveys that utilize the results of laboratory research. As an example, highly promising results are being obtained from a research project on methods of finding hidden ore deposits by making very delicate chemical tests showing the minute metallic mineral content of the soils and surface and underground waters. Even the chemical composition of certain plants growing near or over a hidden ore body is a useful indicator.

At present, as you will see by reference to the map in Figure 2, only about 10 percent of the United States and about 1 percent of Alaska have been mapped geologically in enough detail to serve as an adequate basis for mineral exploration and appraisal. Geologic mapping and the research that must accompany it are slow, expensive operations. Discovery of new deposits can be expected only as the result of several years of preliminary painstaking investigation, and in many instances full-scale production from any resulting discoveries cannot be attained in less than five or more years.

Our cardinal problem, therefore, is to plan and execute our program years ahead, if it is to be effective in maintaining our supply of mineral products.

Our responsibility is to conduct the necessary research and geologic mapping commensurate with the need for continuing supplies of petroleum, natural gas, and metallic and non-metallic mineral resources to meet the Nation's expanding requirements. It is our policy to concentrate on only those phases of the national mineral raw materials supply problem that industry is not equipped to undertake or that they will not undertake because the risk is too great. It is our policy to encourage private industry to take over at any stage.

Our mineral program is planned and coordinated with that of the Bureau of Mines. The long-range national requirements are determined and projects are laid out jointly. The Survey carries out the mapping and prospecting through the exploration phases until the extent and approximate value of new deposits have been determined. The Bureau of Mines then makes its investigations of mining



methods, development, and metallurgy. The results of these investigations are announced through publications.

The geologic maps are multipurpose maps: They yield valuable basic information for classifying the public land for its potential mineral value, for determining the ground-water resources, and for aiding the construction agencies in planning their programs. For example, the Division of Soil Survey of the Department of Agriculture needs thousands of square miles of geologic mapping to serve as a basis for their soils surveys. With the data provided by geologic maps they can make better soils surveys and make them more economically.

WATER RESOURCES

An adequate water supply is of vital importance in maintaining and expanding the national economy. Water is a mobile, renewable resource. But it is available only in finite amounts, and only a portion of the available supply can be stored.

The Geological Survey is entrusted with the determination of the water supply of the United States, and systematically gathers data on the quantity and quality of water in the rivers and underground.

In cooperation with States and other Federal agencies the Survey has established a nationwide network of stream-gaging stations that furnish data essential for the development of surface water resources. About 6,000 stream-gaging stations are now in operation, of which only 2,500 have records of 15 years or more. Most of the stations are newly established, having followed in the wake rather than in the lead of the large water developments during the past 15 years. Yet stream flow is exceedingly irregular and often unpredictable. Long-continued operation of gaging stations in advance of development is the only safe procedure, as well as the most economical, for determining the amounts of water perennially available for use. Few of us realize the meager basis of stream-flow data on which many of our major river development plans are based. The data supplied economically by continuous operation of a simple gaging station is often the cheapest and most effective means of avoiding costly and controversial issues growing out of water development.

The chemical and physical quality of water has an important bearing on its usefulness. Not all water can be successfully used for irrigating crops, though some types of mineralized waters can be used provided large quantities are available to maintain a proper leaching of salts from the soil. For example, it has recently been found that boron in irrigation water may be the cause of damage to the citrus groves along the Rio Grande in Texas. The neglect of water chemistry has caused the ruin of many irrigated farms.

The volume and character of silt carried by rivers is an important factor in the design of reservoirs and irrigation systems, and in the industrial uses of water. Erosion and sedimentation effected by surface water have a significant bearing on their productivity. The Survey conducts investigations in both these fields.

The Geological Survey also assembles critical data on floods which are basic to the design of flood-control structures. Floods are a perennial problem. Flood damage is mounting annually, in large part owing to poorly designed protective structures or imprudent land use. Key bridges are destroyed each year because of improper design due to lack of statistical data on floods. The resulting direct and indirect loss to industry is enormous.

Many types of problems face us in all parts of the country. Before they can be attacked successfully we must know how much water is available in each area. This requires intensive geologic and hydrologic studies, coupled with long-term records of ground-water withdrawals and of water levels in observation wells. Many of the problems of determining quantities of ground-water available, and analysis of observation-well records in terms of continuing availability of water, will have to be solved through scientific techniques yet to be developed. Ground-water hydrology is a young and vigorously developing science, but the current scale of research is so limited that there is a real danger of stultification of the science before techniques are devised for doing the job as well and as cheaply as it can and should be done.

PUBLIC LANDS AND CONSERVATION

The Geological Survey is also responsible for (1) the examination and classification of the public lands with respect to mineral and water-power resources; and (2) the enforcement of the mineral-leasing laws, involving technical supervision of private development operations on leases on acquired, public, Indian, and naval petroleum reserve lands. All phases of the work are requisite to the continued functioning of the system of public-land administration prescribed by existing law. The Survey also renders to agencies of the Interior Department, including the office of the Secretary of the Interior, advice on technical problems of public land administration.

The responsibilities related to minerals include the determination of Federal-land areas to be withdrawn from entry for purposes of mineral investigation and classification; subsequent classification of the lands as mineral or non-mineral; and the initiation of orders of restoration or release of lands from withdrawal. Under the mineral-leasing laws the Survey determines and defines the "known geologic structure" of producing oil and gas fields as the basis for discrimination between the lands subject to lease by application or by competitive bidding at public auction; determines, for each oil and gas lease applicaton, that the land sought is, or is not, within the known geologic structure of a producing field; appraises and reports to the Bureau of Land Management first discoveries of oil and gas under application leases, and discoveries of new oil or gas fields or deposits pursuant to applicable law for their pertinent effect on rental and royalty liabilities; and carries out comparable classification activities involving lands valuable for coal, oil shale, phosphate, potash, sodium, etc., under the mineral leasing laws.

The responsibilities for the classification of the public lands as to their water-power and water-storage possibilities require the collection of basic data on the water resources of the public lands, including topographic, geologic, and geophysical surveys; office investigations, preparation of related maps, charts, and reports; and the segregation in permanent reserves of lands that will be needed eventually for purposes of power development or water storage; the elimination from such reserves of lands found to be valueless for power or water storage purposes; the processing of applications for rights of way on or across public lands for power structures, conduits, canals, and transmission lines; the recommendation of appropriate action to be taken by the Federal Power Commission; the supervision of construction and operations pursuant to power permits or grants by the Secretary of the Interior and the collection of rentals thereunder; the preparation of reports to the Bureau of Land Management on the water-resource value of lands sought under a variety of public-land laws; and the furnishing to State and Federal agencies, and to individuals and corporations, concerned with the conservation and development of stream-flow capacities, of pertinent data bearing on the problems of water power, irrigation, flood control, navigation, and water supplies for domestic and industrial use in the public-land States.

In the enforcement of the mineral-leasing laws the Survey supervises operations and activities concerned with the prospecting, development and production of various leasable minerals under under 25,000 leased properties. The responsibility includes advance approval of operating plans and procedures, or necessary deviations therefrom, involving minerals, fuels (liquid, gaseous, and solid) and fertilizers under leases on Federal, Indian and certain naval petroleum reserve lands subject to the various mineral-leasing laws; periodic and frequent visits to effect the enforcement of regulations governing producing, mining, and milling methods; field investigations and studies looking to the improvement of recovery practices; the estimation of reserves of minerals; the prevention of waste, and the safety and welfare of workmen; the preparation of engineering reports and recommendations as to leasing for the guidance of administrative officials in the Interior Department; and the preparation of maps and reports for public information describing the results of the foregoing investigations.

THE STRONTIUM METHOD FOR MEASURING GEOLOGIC TIME

The following abstract was reprinted from the paper "Measuring Geologic Time by the Strontium Method", by Dr. Louis Ahrens, which was published in the February 1949 issue (Vol. 60, No. 2 pp. 217-266) of the Bulletin of the Geological Society of America:

The strontium method for measuring geological age has been examined in each of its aspects, and the general conclusion is made that evidence is now sufficient to show this method as capable of providing reliable age measurements.

Of the total strontium in the earth's crust, 0.5—1.0% is considered to be radiogenic, almost all of which is concentrated in potassium and cesium minerals. Lepidolite contains the highest proportion of radiogenic strontium, in which mineral it usually predominates completely. Amazonite, pollucite, hydrothermal pegmatitic microcline, zinnwaldite, some specimens of lithium-rich muscovite, and probably also rhodizite and lithium-rich biotite commonly contain a high proportion of radiogenic strontium; age measurements may be made on most of these minerals, if not all. Age determinations on other minerals are also possible, and the strontium method could probably be extended to granite biotites, which would increase its scope very considerably. With lepidolite, a reasonably reliable age can be obtained in most instances without an isotope analysis, although one is desirable. An isotope analysis is imperative for age determinations on all other minerals. For a quantitative isotope analysis of strontium, the mass spectrograph is superior in sensitivity and accuracy to other methods; a quantitative analysis can be made on as little as 0.3 mg. of strontium salt, and a conveniently low proportion of radiogenic strontium can be determined in the presence of an excess of common strontium.

In all, 32 strontium age determinations are known, 30 of which have been made according to a spectrochemical procedure outlined in this paper. The procedure is rapid—10-15 determinations (without isotope analyses) may be made in quadruplicate in three days — but lacks precision, since age reproducibility is usually only within about plus or minus 10–15%, even when carried out in quadruplicate. A more accurate procedure for determining Sr/Rb ratios is urgently needed to increase the usefulness of the strontium method; investigation of other spectrochemical methods is recommended.

Where comparisons were possible, strontium ages tally reasonably well with lead and helium (magnetite) ages, with few exceptions.

The strontium method should be of particular value in pre-Cambrian time and is probably superior to the lead and helium methods for dating very ancient rocks. The extreme antiquity of pegmatites from southeast Manitoba has been established beyond reasonable doubt; their age (2100×10^6 years) is considered to be greater than any other region on the earth's crust on which sufficient data are available. The method is, however, apparently not so suitable for dating relatively young specimens and even under the most favorable circumstances, that is, if lepidolite is available, it seems unlikely that an age of less than 50 x 10^6 years could be measured successfully.

Lead, helium, and strontium methods have been compared.

Letters To The Editor

Dear Mr. Eisenberg:

I am enclosing . . . a snapshot of the Gros Ventre slide taken July 10, 1948. It is not a top quality photo, due to a slight overcast, but it is different from any you have published.

My first view of the slide was in July, 1925, from Jenny's Lake at the foot of the Grand Tetons, just the reverse of the picture on page three of the January issue. The slide is an awesome sight, certainly worth traveling 25 miles of rough, narrow, twisting mountain road to reach the slide site. By the way, the Gros Ventre river is ideal for fly fishing both above and below the slide.

May I compliment you on the way the magazine is being handled.

CHARLES M. MABEY,
Clearfield, Utah.

Dear Mr. Eisenberg:

. . . You have done a very good job, and I would like to say the articles are all well chosen and of the type which readily impresses a layman interested in geology. I do not doubt for a moment that if the standard you have set for the magazine is kept up it will admirably serve those for whom it is intended. . . .

SHARAT K. ROY,
Chief Curator of Geology
Chicago Natural History Museum

DR. ALFRED H. BELL ELECTED A. A. P. G. EDITOR

Dr. Alfred H. Bell, head of the Illinois State Geological Survey's Oil and Gas Division, was recently elected editor of the American Association of Petroleum Geologists. The Association includes practically all American oil geologists and has a membership of over 6,000.

Dr. Bell served on many of the Association's committees in the past and currently is active on the Medal Award committee and the Committee on Statistics of Exploratory Drilling. He joined the Illinois State Geological Survey staff in 1926, and is the author of numerous publications in petroleum geology.

BOSTON MUSEUM OF SCIENCE TO BE LOCATED IN "SCIENCE PARK"

The acquisition of the six-acre Charles River Dam park in Boston for the future home of the Boston Museum of Science, formerly the New England Museum of Natural History, was announced recently by Bradford Washburn, Director of the Museum.

A 99-year dollar-a-year lease was obtained from the Commonwealth of Massachusetts after nearly a year of negotiation. On February 7, 1948, the Board of Trustees of the Museum accepted Governor Dever's suggestion that the location of the new Museum be called Science Park.

New Books

MINERALS AND HOW TO STUDY THEM — by the late Edward Salisbury Dana. Revised by Cornelius S. Hurlbut, Jr. 1949. 323 pp., 387 illus.; $3.90. (John Wiley & Sons, Inc., New York). In this thoroughly revised third edition of a classic work, written expressly for the amateur mineralogist, Dr. Hurlbut presents the reader with an interesting and readable approach to the science without sacrificing scientific accuracy.

In the chapter on The Description of Mineral Species, the minerals are arranged according to the classification used in the new Dana's System of Mineralogy; that is, by chemical groups, rather than by the most prominent elements of the minerals as was followed in the last edition. A list of common minerals arranged according to prominent elements is added as Appendix I.

The number of minerals mentioned has been greatly reduced, only about 150 being described. Added to this listing for the first time are calaverite, colemanite, cristobalite, enargite, and kernite. Among others, dioptase and columbite have been removed from the text.

The chapters on The Use of the Blowpipe and The Chemical Properties of Minerals have been shortened considerably; the latter principally because the chemical classification of minerals is now included in the chapter on The Description of Mineral Species.

Of great interest is a section on Crystal Growing, especially prepared for this revision by Dr. Howard T. Evans, Jr., in which the reader is supplied with directions for growing artificial crystals. This new approach to the study should do much to stimulate greater interest in crystal chemistry.

In the revised List of Most Important Minerals for a Small Collection, Dr. Hurlbut adds amblygonite, magnesite, and smaltite, and discards columbite, mimetite, pectolite, vanadinite, and zoisite.

It is quite possible that this book will see widespread use as a text for a one-term course in mineralogy.

The amateur mineralogist will find the determinative tables, which are a simplified version of those used in Dana's Manual of Mineralogy, of great assistance in identifying those minerals which are ordinarily encountered in the field.

—J. M. E.

SEDIMENTARY ROCKS — by F. J. Pettijohn. 1949. 526 pp., 40 pls., 131 fig.; $7.50. (Harper & Brothers, New York). This compendium is the seventh in the Harper "geoscience series" and the editor, Carey Croneis, believes that it will become "the most useful single volume given to the observation, classification, and interpretation of the sedimentary rocks, both in outcrop and as hand specimens."

This book not only reflects Dr. Pettijohn's many years of experience as a teacher at the University of Chicago and as field worker, but provides a "working bibliography" of more than 700 papers, representing the investigations of approximately 400 authors.

The author, who has succeeded to editorship of the Journal of Geology, has written an exceedingly readable volume that is stimulating and provocative. Its value is further enhanced by excellent illustrations in the form of 104 photomicrographs reproduced for the first time in a text by the collotype process.

Anyone who has searched through the literature for definitive rock terms (two of these, graywacke and arkose, for example, come to mind immediately) and who has found as many definitions as authors consulted, will welcome Dr. Pettijohn's forthright approach to the problem of classification.

"Precision in classification," said Grabau years ago, "leads to precision in thought." The time-honored division of all rocks into three categories, igneous, sedimentary and metamorphic, has in the opinion of Dr. Pettijohn "blocked constructive thinking on the classification problem." A good descriptive scheme, he holds, must utilize genetically significant properties. Hence, "the textures and structures of a tuff and a sandstone are much more alike than those of sandstone and rock salt. On the other hand, the textures and structure of granite and rock salt are more akin than those of tuff and granite. Similarity of origin leads to similarity in appearance."

While Nature most certainly does not draw sharp lines, and the problem of a proper name for a rock is indeed a difficult one, Dr. Pettijohn looks to the igneous petrologist. The terms rhyolite, gabbro, or shonkinite, for example, denote rocks with a special combination of minerals and textures. "A term such as bradfordite," he suggests, "might become a synonym for that particular type of subgraywacke, described by Krynine, that is found in the Bradford district of Pennsylvania. One commonly sees reference to 'the Bedford (Spergen) type of limestone.' Why not spergenite?"

Weathering, transportation, deposition, and lithification and diagenesis are handled in sequence in a style that is both lucid and vigorous. Some 140 tables are particularly informative. But the value of the book also lies in its presentation to the student of the methods and aims of the field geologist, whether his problem be one of foreland facies, the origin of dolomite, the size decrease of a grain of sand during its journey from Cairo to the Gulf, or the still-obscure causes of such an apparently simple phenomenon as "desert varnish."

"Sedimentary Rocks" is a valuable addition to the literature of earth science. Harper & Brothers, New York.

—H. P. Z.

FLUORSPAR AND FLUORINE CHEMICALS (Report of Investigations — No. 141, State Geological Survey, Urbana, Ill.) Part I — Economic Aspects of the Fluorspar Industry — by N. T. Hamrick and W. H. Voskuil; Part II — Fluorine Chemicals in Industry — by G. C. Finger and F. H. Reed. 1949. 70 pp., 7 figs.; distributed on application to the Survey. This work was done in order to present the economic aspects of the fluorspar industry and a review of the chemical fluorine chemicals in industry. Included is an extensive bibliography and a statistical summary of the fluorspar industry.

OIL AND GAS DEVELOPMENTS IN KANSAS DURING 1947 (Bulletin 75, State Geological Survey of Kansas, Lawrence, Kansas) — by W. A. Ver Wiebe, G. E. Abernathy, J. M. Jewett, and E. K. Nixon. 1948. 230 pp., 51 figs.; $0.25. 103,916,169 barrels was the total Kansas oil production for 1947, 7.5 percent more than the 1946 production, and within 3 million barrels of the record set in 1943. Natural gas production reached an all-time high of 183 billion cubic feet. Secondary oil recovery showed a rapid increase in importance in Kansas. Annual oil production in the State is recorded for individual pools and producing areas.

GEOLOGY AND ORE DEPOSITS OF THE LIBBY QUADRANGLE, MONTANA—by Russell Gibson. 1948. 131 pp., 11 pls., 7 figs.; $0.55. (Bulletin 956, United States Geological Survey, Washington, D. C.) The Libby quadrangle lies in northwestern Montana and includes parts of the Cabinet, Purcell, and Bitterroot Mountains. The regional geology, and the detailed geology of many mines are described. Silver-lead-zinc veins and gold-bearing veins form the principal ore deposits.

COMMERCIAL GRANITES AND OTHER CRYSTALLINE ROCKS OF VIRGINIA (Bulletin 64, Virginia Geological Survey, University, Virginia) — by Edward Steidtmann. 1945 (1949). 152 pp., 10 pls., 23 figs. The purpose of this investigation was to make a study of the industrial uses of granites and other crystalline rocks in the Piedmont and Blue Ridge provinces of Virginia. It discusses some of the elementary features of granite and of the economic factors to be considered in undertaking quarry operations.

MINES OF ONTARIO IN 1946 (Annual Report, Vol. LVI, Part II, 1947, Ontario Dept. of Mines, Toronto, Ontario) — by W. O. Tower, R. L. Smith, W. E. Bawden, D. F. Cooper, L. K. Walkom, E. S. Little, A. T. Kirk, E. B. Weir, D. P. Douglass, J. L. Ward, and C. M. Barrett. 1949. 124 pp.; free. A detailed account of mining operations and statistical data. This report includes data on apatite, corundum, feldspar, fluorspar, gold, graphite, gypsum, iron, lignite, magnesium, mica, nepheline syenite, nickel and copper, silver and cobalt, and talc.

GEOLOGY OF HEARST AND McFADDEN TOWNSHIPS (Annual Report, Vol. LVI, Part VIII, 1947, Ontario Dept. of Mines, Toronto, Ontario) — by Jas. E. Thompson. 1949. 34 pp., 14 figs., geological map (1947-1); free. Rock formations of this area consist largely of early pre-Cambrian volcanics, sediments, and intrusives, containing a series of early Pre-Cambrian folds. "The area is believed to contain favorable geological conditions for the occurrence of commercial gold deposits . . . The old-time prospecting methods could be employed to advantage along with more recent methods of exploration." A colored geological map of the township of Hearst and a portion of the township of McFadden, District of Timiskaming (Scale, 1 inch to 1,000 feet) accompanies the report.

PRELIMINARY REPORT ON ECHO TOWNSHIP, DISTRICT OF KENORA (P. R. 1948-10, Ontario Dept. of Mines, Toronto, Ontario) — by H. S. Armstrong. 1948. 5 pp., map; free. The consolidated rocks are all of pre-Cambrian age. The major structure appears to form the north limb of a syncline. The volcanics are highly folded. Of the greatest economic importance in this area is gold, however the discovery of very high grade deposits is not expected.

PRELIMINARY REPORT ON THE GEOLOGY OF DARLING TOWNSHIP AND PART OF LAVANT TOWNSHIP, LANARK COUNTY (P. R. 1948-12, Ontario Dept. of Mines, Toronto, Ontario) — by P. A. Peach. 3 pp., map; free. The entire area is underlain by pre-Cambrian rocks, consisting mainly of sediments: crystalline limestone, schists, and gneisses. The schists and limestones are considerably folded. Small iron deposits are numerous in this area.

THE MINING INDUSTRY OF THE PROVINCE OF QUEBEC IN 1946 (Annual Report, Dept. of Mines, Quebec) — prepared under the direction of R. H. Taschereau. 1948. 162 pp.; free. A detailed account of mining operations and statistical data. For the first time in 15 years, the metals produced were exceeded in value by the combined production of industrial minerals and mineral building products, which rose in value to a new record of over 50 million dollars. Included in this report is a complete list of the principal operators and owners of mines and quarries in Quebec, with their addresses and location of mines.

SIMON LAKE AREA, PAPINEAU COUNTY (Geological Report 33, Dept. of Mines, Quebec) — by Carl Faessler. 1948. 29 pp., 4 pls., 2 figs., geological map (638); free. The map-area lies some 75 miles west-northwest of Montreal, and is readily accessible by several roads branching northward from the Montreal-Ottawa highway. The area lies on the southern margin of the Canadian Shield, of which it is a part. All the consolidated rocks are of pre-Cambrian age, and consist mainly of metamorphosed sedimentary rocks of the Grenville series, cut by numerous intrusives, ranging from gabbro to granite. Some development work has been carried out on a nickel-copper prospect. The report is accompanied by a colored geological and topographical map (Scale, 1 inch to 1 mile).

OPTICAL CALCITE DEPOSITS OF THE REPUBLIC OF MEXICO (Bulletin 954-D, United States Geological Survey) — by Carl Fries, Jr. 1948. 67 pp., 10 pls., 8 figs.; $0.20. The occurrence of optical calcite in 26 districts and 4 individual mines in Mexico is described. The author reviews the history of the exploration and mining of this mineral in Mexico, and the varieties and properties are discussed, accompanied by a summary of terms applied, common defects and their recognition, consumption, markets, prices, and the geologic character of the Mexican deposits.

MANGANESE DEPOSITS OF MEXICO — by P. D. Trask and Jose Rodriguez Cabo, Jr. 1948. 107 pp., 1 pl.; $0.35. (Bulletin 954-F, United States Geological Survey, Washington, D. C.) Manganese has been reported from 335 deposits in Mexico. Deposits are of four main types: (1) fissure deposits in volcanic rocks, (2) silicified replacement in tuffaceous and volcanic rocks, (3) limestone replacement deposits, and (4) tuff replacement deposits. The location, ownership, geology, production, and reserves of each known manganese deposit are given.

GEOLOGY OF THE HUAHUAXTLA MERCURY DISTRICT, STATE OF GUERRERO, MEXICO — by David Gallagher and Rafael Perez Siliceo. 1948. 27 pp., 3 pls., 3 figs.; $0.55. (Bulletin 960-E, United States Geological Survey, Washington, D. C.) Limestone and shale, both Upper Cretaceous, are the principal rock formations. Ore bodies occur in breccia along the Huahuaxtla fault, black cinnabar being the chief ore mineral. The future of the principal deposit looks promising.

1949 ONTARIO DEPARTMENT OF MINES SURVEY PROGRAM ANNOUNCED

TORONTO, Feb. 7 — Reconnaissance mapping of the general area surrounding Theano Point, as well as the mapping and examination of radioactive occurrences on the east shore of Lake Superior, are included in the comprehensive 1949 survey program of the Geological Branch of the Ontario Department of Mines. This announcement was made by Honourable Leslie M. Frost, Ontario Mines Minister and Provincial Treasurer.

"The emphasis this year is on radioactive minerals, base metals, industrial minerals, and ground water supply in southern Ontario," Mr. Frost said.

The continuing demand for base metals, and recent discoveries of pitchblende in the Algoma district, coupled with the fact that little interest is presently being shown in gold prospecting, explains the concentration of attention on other minerals. However, detailed mapping in Harker and Hislop townships, on the eastern extension of the Porcupine belt, and the Little Long Lac area, will be carried out, but these are the only two "gold" areas involved in this year's proposed program.

Other projected work by the Branch includes diamond drilling in the Moose River Basin to determine startigraphic succession of the formations; the continuation of detailed mapping of the Cobalt area; examination of the cobalt-nickel deposits in the Werner Lake area, to the north of Kenora; mapping of Lavant township, Lanark county, and the checking by ground parties of data obtained by the aerial magnetometer surveys in parts of southeastern Ontario. This particular work, Mr. Frost explained, is connected with the search for iron deposits.

GOLD PRODUCTION IN ONTARIO IMPROVING

TORONTO, Feb. 3 — That the gold mining industry is slowly but definitely moving into better ground is indicated, at least by the Monthly Gold Bulletin of the Statistics Branch of the Ontario Department of Mines, with the release today of figures covering production for 1948.

During the year, milling of 8,488,364 tons produced bullion valued at $72,174,-377. Gold recovered amounted to 2,054,-353 ounces and silver to 409,642 ounces. These figures represent an increase of 10.93% in tons milled, 7.65% in gold recovered, 20.92% in silver recovered, and 7.64% in value, over the comparable period for 1947.

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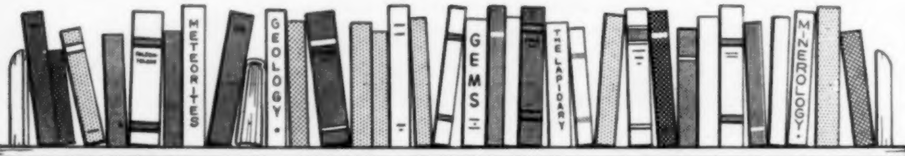

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